A Study of Bismuth Bearing Materials via Electrochemical Codeposition with *in situ* TXM and Xray Microdiffraction

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Electrochemical devices can leverage the alloying/dealloying and plating/stripping of bismuth and bismuth bearing alloys in applications from sensors to energy storage. Key to the optimization of these devices is understanding of the structure of the deposition as related to the deposition kinetics of the codeposit. In the current study we employ a mixture of in situ TXM and micro diffraction. We examine the co-deposition of bismuth with zinc as this couple is useful for energy storage applications.

The nanoscale deposition mechanisms and morphological evolution of zinc and bismuth were studied with a liquid cell TXM and micro diffraction. It is observed that zinc grows behind a front of zinc-rich bismuth metal. We hypothesize this growth mechanism arises from a balance between the solubility of zinc in bismuth, the lattice mismatch between zinc and bismuth, and the electronic conductivity of the deposited material.